In [26]:
```
import numpy as np
import math116
import sympy
```

In [2]:
```
a_1=12440247510743695665321499573154118038028099714936999722129 9
a_2=19984722937481782369560494071536943008549455224247843460895 5
a_3=22085817674943749189957662998518638133336550802592899999555 3
a_4=22787877334518316943825392012920194612106669913904617652958 5
a_5=26749095477605381495579961540324275035967080724187760497561 1
a_6=32455947641360968130689432886417916672604873790296238469220 8
a_7=35413871651274309812040260309117571333195265695446194104043 3
a_8=36499301078355108570595952975389028186371755376787447039116 0
n=10455921617482295286110724372026134360413868268577442221776 53
```

In [3]:
```
a_1_2=pow(a_1,2,n)
a_2_2=pow(a_2,2,n)
a_3_2=pow(a_3,2,n)
a_4_2=pow(a_4,2,n)
a_5_2=pow(a_5,2,n)
a_6_2=pow(a_6,2,n)
a_7_2=pow(a_7,2,n)
a_8_2=pow(a_8,2,n)
```

In [20]:
```
a_8_2
```

Out[20]:
```
298995840
```

In [21]:
```
a_1_2_a=np.array([6,3,0,2,0,0])
a_2_2_a=np.array([6,1,2,1,2,2])
a_3_2_a=np.array([5,0,1,2,0,0])
a_4_2_a=np.array([0,0,2,1,0,0])
a_5_2_a=np.array([3,3,3,2,0,2])
a_6_2_a=np.array([7,1,3,3,1,1])
a_7_2_a=np.array([2,1,2,1,1,1])
a_8_2_a=np.array([7,3,1,0,3,1])
```

In [22]:
```
a_1_mod=a_1_2_a%2
a_2_mod=a_2_2_a%2
a_3_mod=a_3_2_a%2
a_4_mod=a_4_2_a%2
a_5_mod=a_5_2_a%2
a_6_mod=a_6_2_a%2
a_7_mod=a_7_2_a%2
a_8_mod=a_8_2_a%2
```

In [24]:
```
mod_2_matrix=np.array([a_1_mod,a_2_mod,a_3_mod,a_4_mod,a_5_mod,a_6_mod,a_7_mod,a
```

In [25]:
```
mod_2_matrix
```

Out[25]:
```
array([[0, 1, 0, 0, 0, 0],
       [0, 1, 0, 1, 0, 0],
       [1, 0, 1, 0, 0, 0],
       [0, 0, 0, 1, 0, 0],
       [1, 1, 1, 0, 0, 0],
       [1, 1, 1, 1, 1, 1],
       [0, 1, 0, 1, 1, 1],
       [1, 1, 1, 0, 1, 1]])
```

In [27]:
```
M=sympy.Matrix(mod_2_matrix)
```

In [28]:
```
M_rref=M.rref()
```

In [29]:
```
M_rref
```

Out[29]:
```
(Matrix([
 [1, 0, 1, 0, 0, 0],
 [0, 1, 0, 0, 0, 0],
 [0, 0, 0, 1, 0, 0],
 [0, 0, 0, 0, 1, 1],
 [0, 0, 0, 0, 0, 0],
 [0, 0, 0, 0, 0, 0],
 [0, 0, 0, 0, 0, 0],
 [0, 0, 0, 0, 0, 0]]),
 (0, 1, 3, 4))
```

In [30]:
```
a_1_mod*a_2_mod*a_4_mod
```

Out[30]:
```
array([0, 0, 0, 0, 0, 0])
```

In [32]:
```
prod_2=pow(a_1*a_2*a_4,2,n)
```

In [34]:
```
prod_1=pow(a_1*a_2*a_4,1,n)
```

In [35]:
```
math116.gcd(a_1*a_2*a_4-prod_1,n)
```

Out[35]:
```
1045592161748229528611072437202613436041386826857744222177653
```

In [ ]:
```

```